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10/602,600	06/25/2003	Katsushi Ikeuchi	239510US2	1466
22850	7590	02/17/2006	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			PRENDERGAST, ROBERTA D	
			ART UNIT	PAPER NUMBER
			2671	
DATE MAILED: 02/17/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/602,600	Applicant(s) IKEUCHI ET AL.	
	Examiner Roberta Prendergast	Art Unit 2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 October 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Drawings***

The drawings are objected to because Figs. 5 (A-C), 8 (A-D), 9 (A-E), and 10 (A-D) are unintelligible and Fig. 9D does not disclose colors of microfacets that correspond to numbers of the selected cameras found on page 23 of the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Color photographs and color drawings are not accepted unless a petition filed under 37 CFR 1.84(a)(2) is granted. Any such petition must be accompanied by the appropriate fee set forth in 37 CFR 1.17(h), three sets of color drawings or color

Art Unit: 2671

photographs, as appropriate, and, unless already present, an amendment to include the following language as the first paragraph of the brief description of the drawings section of the specification:

The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the Office upon request and payment of the necessary fee.

Color photographs will be accepted if the conditions for accepting color drawings and black and white photographs have been satisfied. See 37 CFR 1.84(b)(2).

***Claim Rejections - 35 USC § 101***

Examiner acknowledges the amendment to claims 14-16 dated 10/27/2005 and therefore the 35 USC § 101 rejections of claims 14-16 is hereby withdrawn.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5, 8, 9, 12, 14, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626.

Referring to claim 8, Suzuki et al. teaches an image processing method for generating an image from a predetermined view direction association with an object to

Art Unit: 2671

be rendered, comprising: generating a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions (Figs. 1-4; column 1, lines 40-49; column 2, lines 30-37; column 7, lines 26-37 and 50-65; column 9, lines 58-66, i.e. first images are the initial video captured images), and second images that pertain to geometry information of the object to be rendered (Figs. 1-4; column 1, lines 40-49; column 2, lines 37-45, i.e. second images are the silhouette images); generating a geometrical shape model of the object to be rendered on the basis of the second images (Figs. 1-4; column 1, lines 40-49; columns 2-3, lines 65-3; column 4, lines 15-20; columns 7-8, lines 65-8; column 8, lines 20-50; column 9, lines 32-45; columns 9-10, lines 58-10; column 10, lines 40-57, i.e. an intersection processor feeds a voxel calculator in order to determine the volume); generating a plurality of microfacets used to approximate a shape of the geometrical shape model (column 3, lines 1-5, i.e. it is understood that microfacets are polygons and all voxels are evaluated to determine the object surface which is output as a triangle mesh model) and generating a third image by selecting texture images from the plurality of first images on the basis of the plurality of photographing directions and view direction, and projecting the selected texture images onto the microfacets (column 3, lines 42-52; column 10, lines 1-18, i.e. the background-subtracted real views and the voxel calculation/microfacets are provided to each unique network client on demand and a novel view/third image is generated by projecting the real views onto the microfacets according to the perspective selected by the client); but does not specifically teach

executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction.

Beasley teaches executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction (column 5, lines 60-67; column 6, lines 62-65; column 7, lines 27-41, i.e. the silhouette images are understood to be projected texture images).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 8 to include executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction thereby reducing the amount of processing time required to model complex objects such as trees, which are commonly displayed by the use of billboards as they are difficult to model in 3D and to further allow the object to rotate in synch with the user's viewpoint so that it's almost constantly facing the user (Beasley; column 2, lines 15-24).

Referring to claim 1, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches an image processing apparatus comprising a memory (Figs. 1(elements 118-120 and 126), 2(elements 208-210 and 220), 3(elements 308-310 and 320), and 4(elements 408-410 and 420); column 7, lines 26-37), a geometrical shape model generation unit (Figs. 1(element 130), 2(element 224), 3(element 324), and 4(element 424); column 7, lines 26-37), a microfacet generation unit (Figs. 1(element 130), 2(element 224), 3(element 324), and 4(element 424); column 3, lines 1-5), and a texture mapping unit (Figs. 1(elements 118-120 and 126),

2(elements 208-210 and 220), 3(elements 308-310 and 320), and 4(elements 408-410 and 420); column 7, lines 26-37) configured to perform the method of claim 8 but does not specifically teach a billboard processing unit.

Beasley teaches a billboard processing unit (Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the geometry subsystem portion of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem comprises the billboard processing unit).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the image processing apparatus to include a graphics subsystem containing a billboard processing unit capable of rotating the plurality of microfacets to make a predetermined angle with a view direction thereby reducing the amount of processing time required to model complex objects such as trees, which are commonly displayed by the use of billboards as they are difficult to model in 3D and to further allow the object to rotate in synch with the user's viewpoint so that it's almost constantly facing the user (Beasley; column 2, lines 15-24).

Referring to claim 14, the rationale for claims 1 and 8 are incorporated herein, Suzu8ki et al., as modified by Beasley above, teaches a computer program product configured to store program instructions for performing the method of claim 8 (Beasley; column 4, lines 18-35 and 48-65). It is inherent that a computer system capable of performing the method of claim 8 is comprised of a computer program product configured to store program instructions for executing the method as described in claim 8.

Referring to claim 9, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 8, wherein the geometrical shape model is a voxel model formed of a plurality of voxels (Figs. 1-4; column 1, lines 40-49; columns 2-3, lines 65-3; column 4, lines 15-20; columns 7-8, lines 65-8; column 8, lines 20-50; column 9, lines 32-45; columns 9-10, lines 58-10; column 10, lines 40-57), and the microfacets are generated for respective voxels (column 3, lines 1-5, i.e. it is understood that microfacets are polygons).

Referring to claim 2, it recites the elements in claims 1 and 9 and therefore the same rejections apply.

Referring to claim 15, it recites the elements in claims 14 and 9 and therefore the same rejections apply.

Referring to claim 12, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 8, further comprising selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and generating an interpolated image on the basis of the at least two first images, and wherein in texture mapping, the texture images are selected for respective microfacets from the plurality of first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and the selected texture images are projected onto the microfacets (Suzuki et al.; column 2, lines 30-37; column 3, lines 23-29 and 42-52; column 6, lines 35-46; column 7, lines 50-65; column 10, lines 45-65, i.e. either the background-subtracted real



views or interpolated novel views are mapped to the microfacets according to the perspective chosen by the client).

Referring to claim 5, the rationale for claims 1 and 12 are incorporated herein, Suzuki et al., as modified by Beasley above, recites the elements in claims 1 and 12 and further teaches an interpolated image generation unit (Beasley: Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the geometry subsystem of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem is further comprised of a interpolated image generation unit) and therefore the same rejections apply.

Referring to claim 18, it recites the elements in claims 14 and 12 and therefore the same rejections apply.

Claims 13, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626 as applied to claims 12, 14, and 18 above, and further in view of Neugebauer, P.J., "Geometrical cloning of 3D objects via simultaneous registration of multiple range images", Shape Modeling and Applications, 1997. Proceedings, 1997 International Conference on 3-6 March 1997 Page(s)130 - 139.

Referring to claim 13, the rationale for claim 12 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches a method according to claim 12 further comprising appending geometry information each pixel of the plurality of first images and the interpolated image on the basis of the second images (column 8, lines 40-50;

column 9, lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel calculation entails appending geometry information, i.e. depth information from the second images, to each pixel) but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

Neugebauer teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel (page 135, section 7 Visibility criterion, 1<sup>st</sup> and 2<sup>nd</sup> paragraphs; page 137, section 8.3. Direct rendering, Fig. 9).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel thereby eliminating self-occlusion errors and making it possible to reconstruct concave and convex objects, and even objects with holes out of an arbitrary number of range images (page 130, Introduction, 3<sup>rd</sup> paragraph).

Referring to claim 19, it recites the elements in claims 13, 14, and 18 and therefore the same rejections apply.

Claims 3, 10, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626 as applied to claims 1-2, 8-9, and 14-15 above, and further in view of Ogata et al. U.S. Patent No. 6313841.

Referring to claim 10, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches a method according to claim 9, but does not specifically teach wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images.

Ogata et al. teaches wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images (Fig. 16; column 3, lines 10-28; column 10, lines 16-49, i.e. the dataset size is understood to be the number of voxels and is controlled by the level of detail, which is understood to be the precision of the second images).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images thereby reducing the expensive computing costs due to processing large numbers of voxels (column 1, lines 18-27).

Referring to claim 3, it recites the elements in claims 1 and 9 and therefore the same rejections apply.

Referring to claim 16, it recites the elements in claims 14 and 9 and therefore the same rejections apply.

Claims 4, 6, 7, 11, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626 as applied to claims 2, 5, 9 and 15 above, and further in view of Gannett U.S. Patent No. 6118452.

Referring to claim 11, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 9, further comprising appending geometry information to each pixel of the plurality of first images on the basis of the second images (column 9, lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel calculation entails appending geometry information, i.e. depth information from the second images, to each pixel), but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

Gannett teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel (column 7, lines 23-45; column 8, lines 34-38; column 9, lines 34-43; column 12, lines 34-51; columns 16-17, lines 55-13, i.e. voxels are eliminated based on a depth buffer test for performing hidden-surface elimination).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel thereby providing significant performance enhancements (Gannett: Abstract; columns 9-10, lines 60-13).

Referring to claim 4, Suzuki et al., as modified by Beasley above, recites the elements in claims 1 and 9 and further teaches a clipping processing unit (Beasley: Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the raster subsystem of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem is further comprised of a clipping processing unit) and therefore the same rejections apply.

Referring to claim 17, it recites the elements in claims 4, 11, and 15 and therefore the same rejections apply.

Referring to claim 6, it recites the elements in claims 1, 4, 11, and 5 and therefore the same rejections apply.

Referring to claim 7, the rationale for claim 4 and 11 is incorporated herein, Suzuki et al., as modified above, teaches an apparatus according to claim 4 wherein the clipping process unit comprises graphics hardware, see rationale for claim 4 and therefore the same rejections apply.

***Response to Arguments***

Applicant's arguments filed 10/27/2005 have been fully considered but they are not persuasive.

Applicant first argues, with respect to claim 1, that "...column 7, lines 27-41 of Beasley states that a snapshot of a three dimensional model is turned into a low-number of polygon billboards to roughly approximate an image, that the three dimensional model is then rotated to a different angle of view, and that these steps are repeated until substantially all angles from which the object can be viewed in a three-dimensional volume are depicted in silhouette form. Thus, Beasley also does not disclose or render obvious the claimed features of rotating a plurality of microfacets used to approximate a three-dimensional shape of a model to make a predetermined angle with a view direction, as recited in independent claim 1...". Examiner respectfully submits that, while Beasley does disclose in column 7, lines 27-41 that a snapshot of a three-dimensional model is turned into a **single polygon or a low-number of polygons billboard** (emphasis added), Beasley also discloses in column 6, lines 55-65 that various silhouettes corresponding to a particular object are created and stored in the texture map and the appropriate silhouette is selected for display and rotated to track the user's viewpoint so that the silhouette is maintained in a frontal view as much as possible and then rendered for display and thus the limitation has been met.

Applicant further argues that "...the plurality of microfacets is rotated so as to form a predetermined angle with a predetermined direction (e.g., view direction). Therefore, the claimed invention includes a billboard processing unit which rotates

the plurality of microfacets to make a predetermined angle with a view direction..." and that "...Beasley, Suzuki, and the other references of record do not disclose or render obvious these features...". Examiner respectfully submits that column 6, lines 35-47 and 55-65 discloses wherein a plurality of microfacets are rotated to form a predetermined angle with a predetermined direction, i.e. the viewpoint direction and thus the limitation has been met.

With regards to claims 2-19, Examiner respectfully requests that applicant look to the arguments for claim 1 above.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RP

  
ULKA CHAUHAN  
SUPERVISORY PATENT EXAMINER